tion Fund towards the close of the year 1883 organised an expedition for the purpose of making a geological survey, or rather reconnaissance, of Western Palestine, and intrusted its conduct to Prof. E. Hull of the Geological Survey. The Report of this expedition is now issued as a handsome quarto volume of 145 pp., with maps and numerous woodcuts. Part I. gives an enumeration of the more important or accessible writings of previous observers, and a description of the physical features of the districts visited. Part II. deals with the geological structure of Arabia Petræa and Palestine, including the Archæan crystalline rocks, and the Carboniferous, Cretaceous, Tertiary, and Post-Tertiary formations. Part III. contains a brief account of the Tertiary Volcanic Rocks. Part IV. is devoted to a discussion of the dynamical operations which may have brought about the present geological structure of the region, and of the evidence of former differences of climate. Part V. treats of the origin of the saltness of the Dead Sea and of the recent climatal changes of that district. The scheme of treatment is thus comprehensive enough, and the details and conclusions are clearly expressed, though they hardly add as much as could have been hoped to what was already known on the subject. The discussion of the dynamical questions is disappointingly meagre. In the problem of the origin of the great Jordan Valley depression there was room for much detailed exposition, wherein a careful collection of the facts of geological structure could have been made conducive to a valuable addition to our knowledge of this important and still obscure branch of geological physics. The history of the surface-features of the region of Western Palestine is a question on which the Report throws very little fresh light, though it is the one to which perhaps above all others the members of a flying corps of observation might have been expected to be able to contribute valuable data. Regarding the changes of climate and the origin of the Dead Sea we should have looked for more new materials and a much fuller discussion than the few paragraphs in which this important subject is dismissed. No doubt Prof. Hull and his companions did as much in the way of observation during their brief visit as was possible in the time, and he has made all that probably could be made of it in this Report. But we are inclined to think that the subject was in such a position that little further could be usefully done to it by the rapid journey even of a trained observer through the country. If the Committee of the Palestine Exploration Fund want to have a satisfactory solution of the many profoundly interesting geological problems presented by Syria and Palestine, they must organise the task as part of the less rapid and more detailed survey of the general topography. The Report is excellently printed and illustrated, the maps being of especial value, containing as they do a summary of all that is known up to the present time regarding the distribution of the rocks in Palestine. There are some errors of the press which on revision the author will no doubt correct in another edition, and we would call his attention to a sentence which betrays his nationality, "The Patriarch Job, whether an actual person or a representative character, may be supposed to have inhabited the Plains of Edom" (p. 123).

A MANUAL OF CHEMISTRY

A Short Manual of Chemistry. Vol. I. "Inorganic Chemistry." By A. Dupré, Ph.D., F.R.S., F.C.S., &c., and H. Wilson Hake, Ph.D., F.C.S., F.I.C. (London: Charles Griffin and Co., 1886.)

"WHY should another hand-book on this subject be added to the many which already exist in the language?" In the first paragraph of their preface the authors anticipate the possibility of this question arising in the minds of some chemists, and they therefore answer it by (1) claiming their right, as teachers of lengthened experience, to record their methods of instruction; and (2) expressing their belief "that the very multiplicity of text-books already published tends to show a want felt, but not yet satisfied."

Their method consists in first laying down general principles which, when thoroughly mastered, are to be followed up with the facts of descriptive chemistry.

The introductory chapters containing these general principles, on which the student "with no previous knowledge of chemistry whatever" is to found his chemical education, comprise about 80 pages of the book, and since the authors lay so much stress on their importance, we cannot pass over this portion of the book without giving a few illustrations of what is to be learnt from the manual apparently intended to supersede all other text-books.

The representation of a molecule by two small circles surrounded by a larger circle (see note on p. 11) may perhaps be mentioned as an instance of the pertinacity with which so many teachers continue to do their best to confuse their pupils with erroneous conceptions of atoms and molecules.

On p. 36 the melting-point of a substance is incorrectly defined as "the temperature at which it is no longer capable of existing as a solid." On p. 37 it is stated that "most substances increase in volume on melting, but some decrease. In the case of the former the effect of pressure is to lower, in the latter to raise, the melting-point." Thomson proved the opposite of this to be the case.

The statement generally found in text-books that a ray of light passing from a rarer to a denser medium is refracted towards the perpendicular, and *vice versâ*, is reproduced on p. 42. If the authors are employing the word *dense* in the optical sense, we think they should say so, if in the ordinary sense, the statement is incorrect.

On p. 43 they describe *total reflection* as taking place when "a ray of light proceeding from a denser to a rarer medium strikes the surface, separating the two media at such an angle that the refracted ray would form a right angle (or any greater angle) with the reflected ray." We would like to know the authority for this curious statement.

On pp. 64 and 65 is a table headed "Table of Symbols, Atomic and Molecular Weights, and Valency of the Elements." It contains a list of all the elements, including those most recently discovered, norwegium amongst the rest, though the existence of the latter metal cannot be said to have been satisfactorily demonstrated. The columns to which we more particularly call attention are, however, those headed "molecular symbol, showing number of atoms in the molecule," and "molecular

weight." Every element has a molecular symbol and a molecular weight assigned to it. Carbon, for instance, is represented by the molecular symbol C_2 and by the molecular weight 28. Now, on pp. 58 and 59 the reader is given to understand that the molecular weight of a substance is the specific gravity of the gas or vapour multiplied by 2 (the sp. gr. of hydrogen being taken as unity). On p. 130 it is further stated that carbon in all its forms is non-volatile. How then is the unfortunate student, or, in fact, any one else, to reconcile these statements with that found in the table that the molecular weight of carbon is 28, and what applies to this element applies of course to most of the others. We may also mention that in another part of the book (p. 160) a molecule of carbon is represented as consisting of twelve atoms. This may of course be a printer's error, but we find the same want of system in symbolic representation throughout the book.

We entirely agree with the authors that Inorganic Chemistry should receive more attention at the hands of chemists, but how is it that the authors do so little justice to what has been done in this branch of chemistry? Garzarolli-Thurnlackh's proof of the non-existence of chlorous anhydride is simply ignored, and the statements found in most text books with reference to this imaginary compound are again reproduced. The action of nitric acid on the metals is also represented by the usual text-book equations.

A good feature in the book is the arrangement of the properties, &c., of the substances described under different headings, which are convenient for ready reference.

There are many more points to which we might refer if space allowed, but we think we have said enough to indicate that in our opinion, at least, this new manual is not calculated to supply the "want felt, but not yet satisfied."

OUR BOOK SHELF

Technical Gas Analysis. By Clemens Winkler, Ph.D. Professor in Freiberg. Translated by George Lunge, Ph.D. (London: Van Voorst, 1885.)

PROF. LUNGE has rendered another service to the world of chemists, both students and practical men, in translating Winkler's small book on "Gas Analysis." We have here a really practical work which a man may use in a works or a teacher or student in a laboratory.

Winkler's book is scarcely known in this country, and we may venture to say that several, if not most, of the gas apparatus figured and described in this book are also scarcely known.

The book is decidedly practical, and treats in the first instance of methods of collecting gases; on measurement of gases; and on apparatus and methods of analysis. The translator has added a chapter on the nitrometer, and shows how it may be used for more extended analyses than the examination of nitrous vitriol. An appendix of useful tables makes the book a very valuable laboratory companion.

Lessons in Elementary Chemistry, Inorganic and Organic. By Sir Henry E. Roscoe, LL.D., F.R.S., Professor of Chemistry in the Victoria University, Owens College, Manchester. New Edition. (London: Macmillan and Co., 1886.)

THIS favourite text-book is so well known to students of chemistry that, whilst calling attention to the appearance of a new edition, we need only remark that the author has introduced several changes and additions which bring the book as well up to date as the limits of a work of this size will permit.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

New System of Earthquake Observations in Japan

OWING to the invention of new seismographs by the members of the Seismological Society of Japan, there has been of late a complete change in the system of earthquake observations in this country. The Meteorological Bureau now employs the horizontal pendulum and vertical-motion seismographs of Profs. J. Milne and T. Gray, and of Prof. J. A. Ewing for systematic observation, while the Imperial University of Tokio publishes from time to time detailed accounts of particular and more interesting shocks by the use of similar instruments. These seismographs register on a revolving glass plate or drum automatically started by the earthquake motion, components of horizontal and vertical motions of the earth on a magnified scale, thus producing continuous diagrams, and indicating successive displacement of the ground in conjunction with the time.

The account of the earthquake of December 28, 1885, the largest shock during the last three months, is here given as a sample of seismic record now issued in this country. The meanings of the terms employed are as follows: a, semi-amplitude of seismic wave; T, period of complete wave; V, maximum velocity in mm. per sec., or $\frac{2\pi a}{T}$; α, maximum acceleration in mm. per sec. per sec. or $\frac{V^2}{a}$.

At the Imperial University of Tokio, Japan, at 10*h.* 6*m.* 30*s. on December* 28, 1885

Maximum semi-amplitude of horizontal motion a_1 ...	1·8
Complete period T_1 corresponding to the max. horizontal motion	1·5
Maximum semi-amplitude of vertical motion a_2 ...	0·3
Complete period T_2 corresponding to the max. vertical motion	0·6
Direction of the max. horizontal motion	E.–W.
Duration	3m. 30s.

Remarks.—The motion slowly commenced, not accompanied by quick tremors, as is usually the case. At the 14th second from the commencement a considerable E.–W. motion occurred; in another second the maximum movement appeared in the same direction, which was followed by smaller shocks during about one minute; and from thence the oscillations gradually subsided. As usual, the particles of the ground did not move to and fro, but traced a curvilinear path, although the E.–W. components always remained greater than the S.–N. components. In all, over 130 shocks or complete waves were registered.

From figures given in the above table, the maximum velocity V and the maximum acceleration α may be calculated, which are, in this case for the horizontal motion, 7·6 mm. per sec. and 39 mm. per sec. per sec. respectively. The latter quantity is the measure of the *intensity* of the earthquake, and may be employed in determining the overthrowing power of body and shattering and other destructive effects produced on buildings. Although the records given by the oscillations of fluids, fissures on walls, rattling of wine-glasses, &c., might tell something about the nature of earthquakes, and are indeed invaluable in absence of suitable instruments, yet for the *absolute* measurements of seismic force the method above cited, I believe, is by far the best that has ever been attempted on this subject.

I may add in respect to the above earthquake, and in general, that the vertical motions are always—in our experience—smaller than horizontal ones, and the maxima and minima of these two kinds of motions are not synchronous. I shall have